

299-W15-09 (A5477) Log Data Report

Borehole Information:

Borehole: 299-W15-09 (A5477)		Site: 216-Z-9 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not measured	GWL Date: N/A		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
135631.369	566763.335	1/59 / 11/66	664.91	194	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	1.35	4	unknown	unknown	1.35	180
Welded steel	1.35	6	unknown	unknown	1.35	194
Welded steel	0.6	8	unknown	unknown	0.6	100

Borehole Notes:

This borehole was drilled to 100 ft in 1959 using an 8-in. casing and deepened to 194 ft in 1966 with a 6-in. casing. Remediation of the borehole in 1987 resulted in a packer set at 180 ft and a 4-in. liner placed to that depth. Grout was emplaced between both the 4- and 6-in. casings and the 6- and 8-in. casings. This grout can be observed at the ground surface.

The tops of the casings have been modified by the addition of a flat 8-bolt flange. Casings are located inside a vapor extraction device used to connect various hose and ball-valve combinations. Therefore, direct measurements of the casing diameters are not possible. Casing stickup was measured by the logging engineer using a steel tape.

All logging measurements are referenced to the top of casing.

Logging Equipment Information:

Logging System:	Gamma 4A	Type:	SGLS (35%) 34TP20893A
Effective Calibration Date:	5/11/05	Calibration Reference:	DOE-EM/GJ891-2005
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 4I	Type:	Passive Neutron U1754
Calibration Date:	None	Calibration Reference:	None
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 - Repeat	4	
Date	06/27/05	06/28/05	06/29/05	06/29/05	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	56.0	185.0	117.0	89.0	
Finish Depth (ft)	2.0	88.0	99.0	55.0	
Count Time (sec)	200	200	400	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A ³	N/A	N/A	N/A	
Pre-Verification	DA051CAB	DA061CAB	DA071CAB	DA071CAB	
Start File	DA051000	DA061000	DA071000	DA071019	
Finish File	DA051054	DA061097	DA071018	DA071053	
Post-Verification	DA051CAA	DA061CAA	DA071CAA	DA071CAA	
Depth Return Error (in.)	- 1	- 2	N/A	- 1	
Comments	No fine-gain adjustment.	Fine-gain adjustments after files – 007, 029, 052, and 069.	No fine-gain adjustment.	Fine-gain adjustment after file -040.	

Passive Neutron Logging System (PNLS) Log Run Information:

Log Run	5	6 - Repeat			
Date	06/30/05	06/30/05			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	160.0	117.0			
Finish Depth (ft)	0.0	99.0			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
Sample Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	DI232CAB	DI232CAB			
Start File	DI232000	DI232161			
Finish File	DI232160	DI232179			
Post-Verification	DI232CAA	DI232CAA			
Depth Return Error (in.)	- 2.5	- 1			
Comments	None	None			

Logging Operation Notes:

Pre- and post-survey verification measurements for the SGLS were acquired using the Amersham KUT (⁴⁰K, ²³⁸U, and ²³²Th) verifier with serial number 115. A centralizer was not used on the sonde.

Passive neutron logging was also performed in the borehole. This logging method has been shown to be effective in qualitatively detecting zones of alpha-emitting contaminants from secondary neutron flux generated by the (α ,n) reaction, and may indicate the presence of transuranic radionuclides.

Analysis Notes:

Analyst:	Henwood	Date:	07/07/05	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day of logging. All of the SGLS verification spectra were within the acceptance criteria. The net counts per second for the 2614.5 keV energy peak was 10 percent lower in the post verification measurement on 06/28/05, which may result in slightly lower calculated ^{232}Th concentrations toward the end of the day's data acquisition. An examination of the data indicates the detectors functioned normally during logging, and the data are accepted.

An AmBe neutron source was used for verification measurements with the PNLS. Currently there are no verification criteria established for this system. The counts obtained from the pre and post verifications were within 1 percent.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G4AMay05.xls). In the absence of any specific information, casing was assigned to be ASTM schedule-40 steel pipe. A combined casing correction for a 0.839-in.-thick casing ($0.237+0.28+0.322$) for the 4-, 6-, and 8-in. casings was applied to the data from 0 to 100 ft. Between 100 and 180 ft, a combined correction for 0.517-in.-thick casing ($0.237+0.28$) for the 4- and 6-in. casings was applied. Below 180 ft, a correction for 0.28-in. thick casing was applied. No corrections for dead time or water were required.

Log Plot Notes:

Separate log plots are provided for man-made radionuclides, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), total gamma and dead time, and total gamma and passive neutron. A combination plot is also included to facilitate correlation. Plots of the repeat logs versus the original logs are provided. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

The Westinghouse Hanford Company Radionuclide Logging System (RLS) was utilized to acquire data in 1995. A plot of the total gamma acquired from this system is provided to compare with the current SGLS total gamma log.

Total gamma data acquired in 1967, 1973, and 1976 are included to provide a further comparison of historical activity levels in the borehole.

Results and Interpretations:

Using the APTEC routine processing software, an energy peak at approximately 662 keV was detected in spectra near the ground surface, at 44 ft, and from 117 to 118 ft. Further scrutiny of the spectra at 44, 117, and 118 ft indicates the peaks are the result of statistical fluctuations and are not valid detections. The peaks near the ground surface are believed to be ^{137}Cs at maximum concentrations of less than 1 pCi/g.

The passive neutron detector indicated no significant neutron flux in the survey depth interval. Slight elevation in count rate (0.9 cps) was observed near the ground surface, but is not believed to be related to any influence from alpha-emitting contaminants.

Interpretation of the KUT for lithology changes was complicated by grout placed between the casings. The relatively low ^{40}K and ^{232}Th values at approximately 111 ft as well as the relatively high ^{238}U values are characteristic of the carbonate paleosols of the Cold Creek Interval.

Westinghouse Hanford Company acquired spectral gamma data in 1995 in this borehole using the RLS. There were no man-made radionuclides detected. The comparison plot of RLS and SGLS total gamma suggests no significant changes since 1995.

The historical total count log data acquired in 1963, 1968, and 1976 are consistent with the current SGLS total count data such that no contamination appears to have existed in the vicinity of this borehole.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the naturally occurring radionuclides and the passive neutron.

¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not applicable

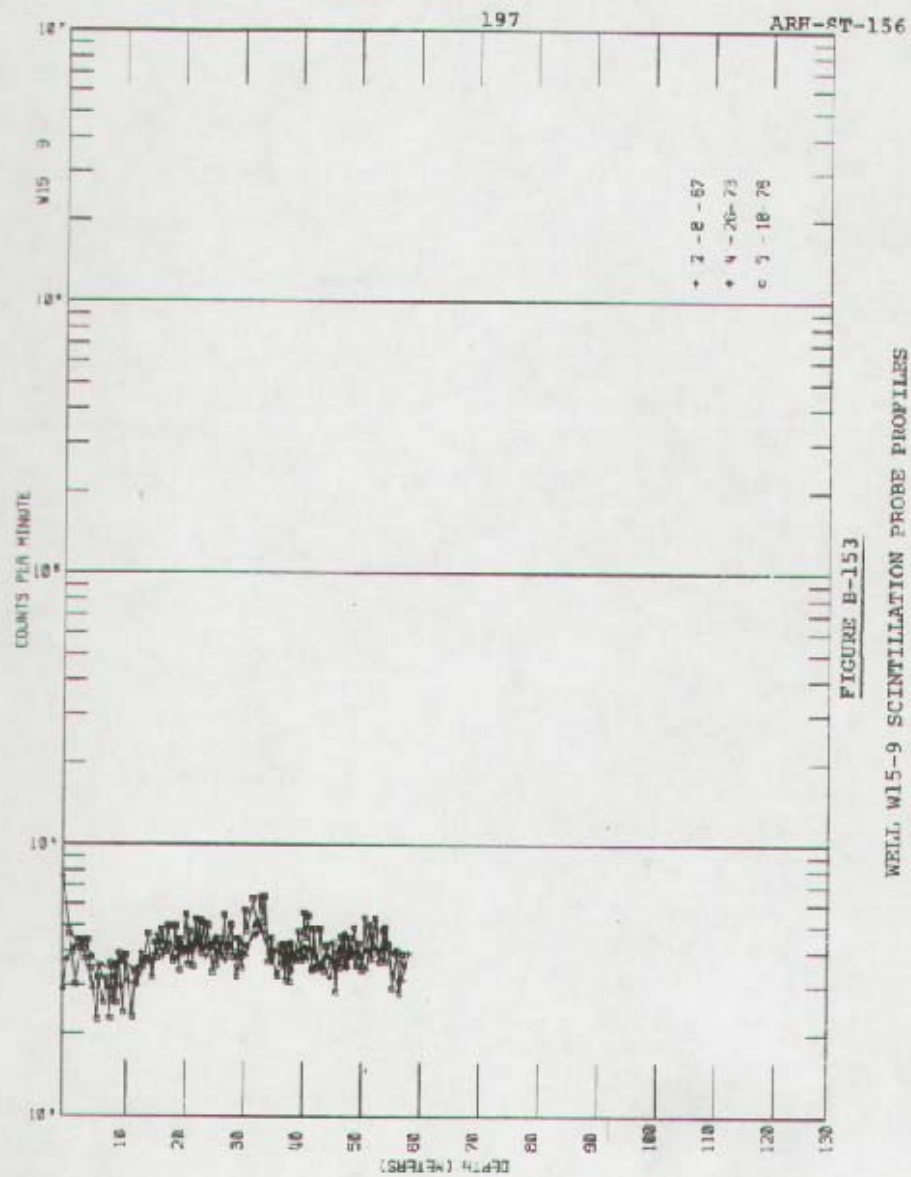
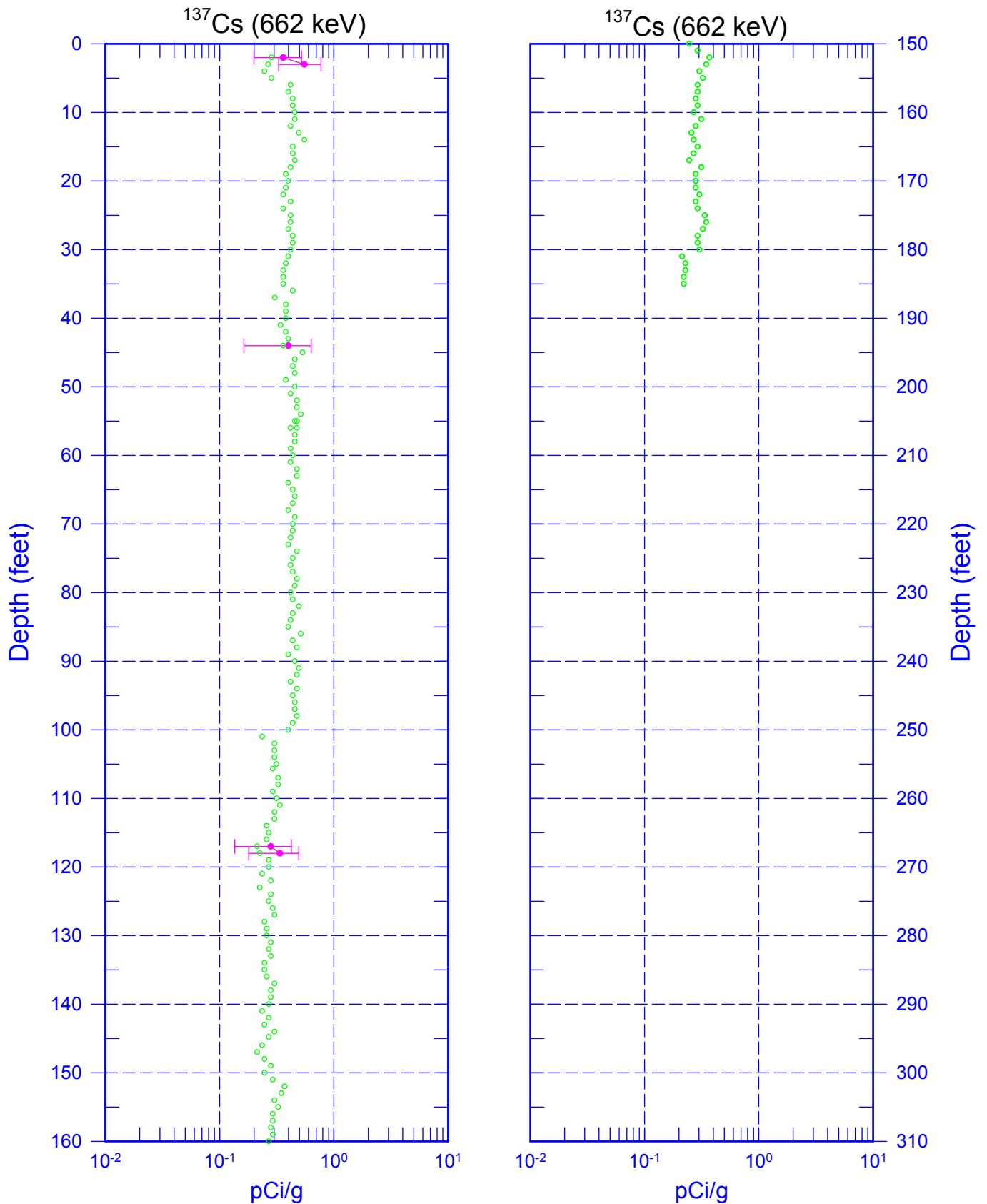


FIGURE B-153
WELL W15-9 SCINTILLATION PROBE PROFILES

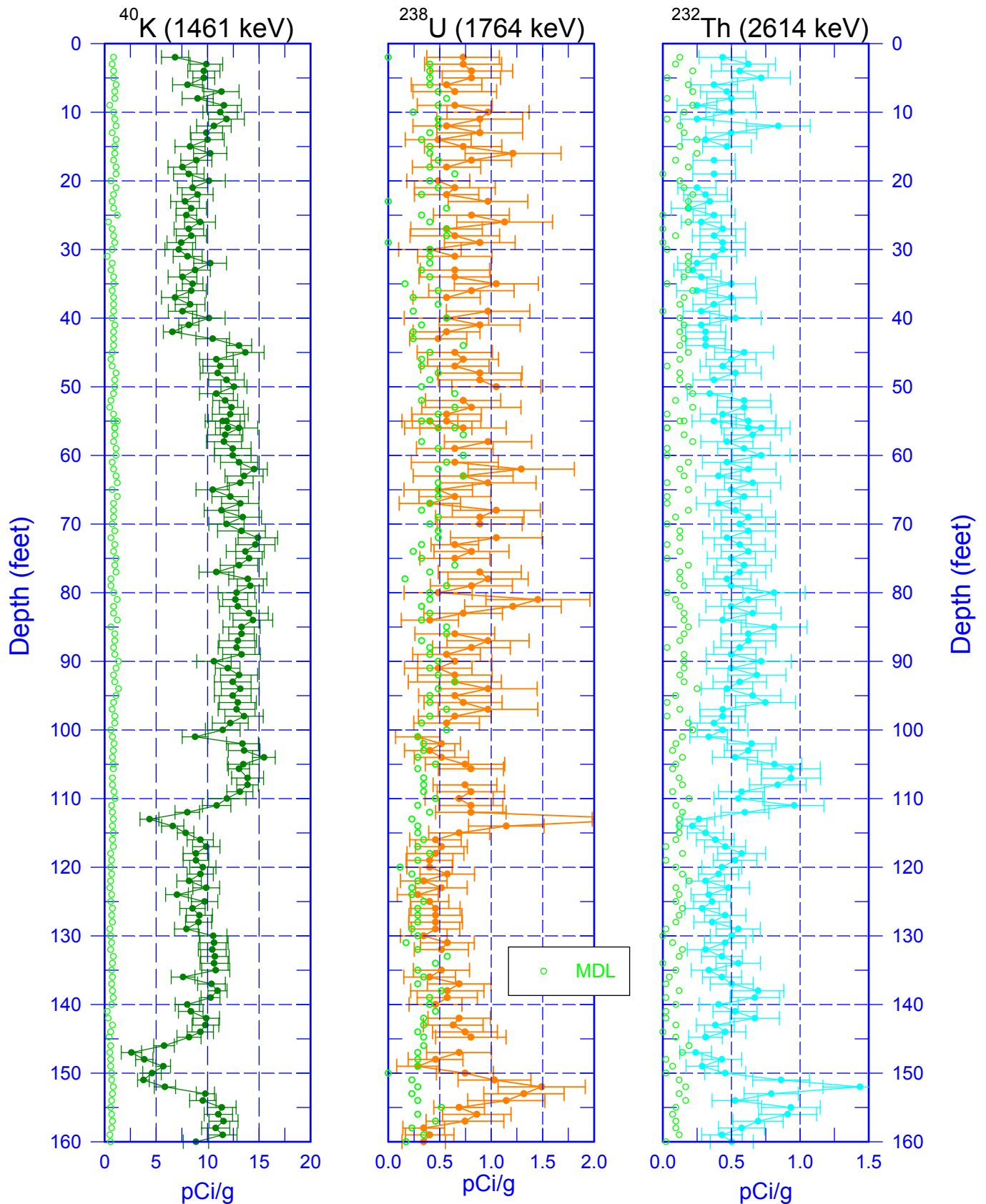
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Man-Made Radionuclides



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Natural Gamma Logs

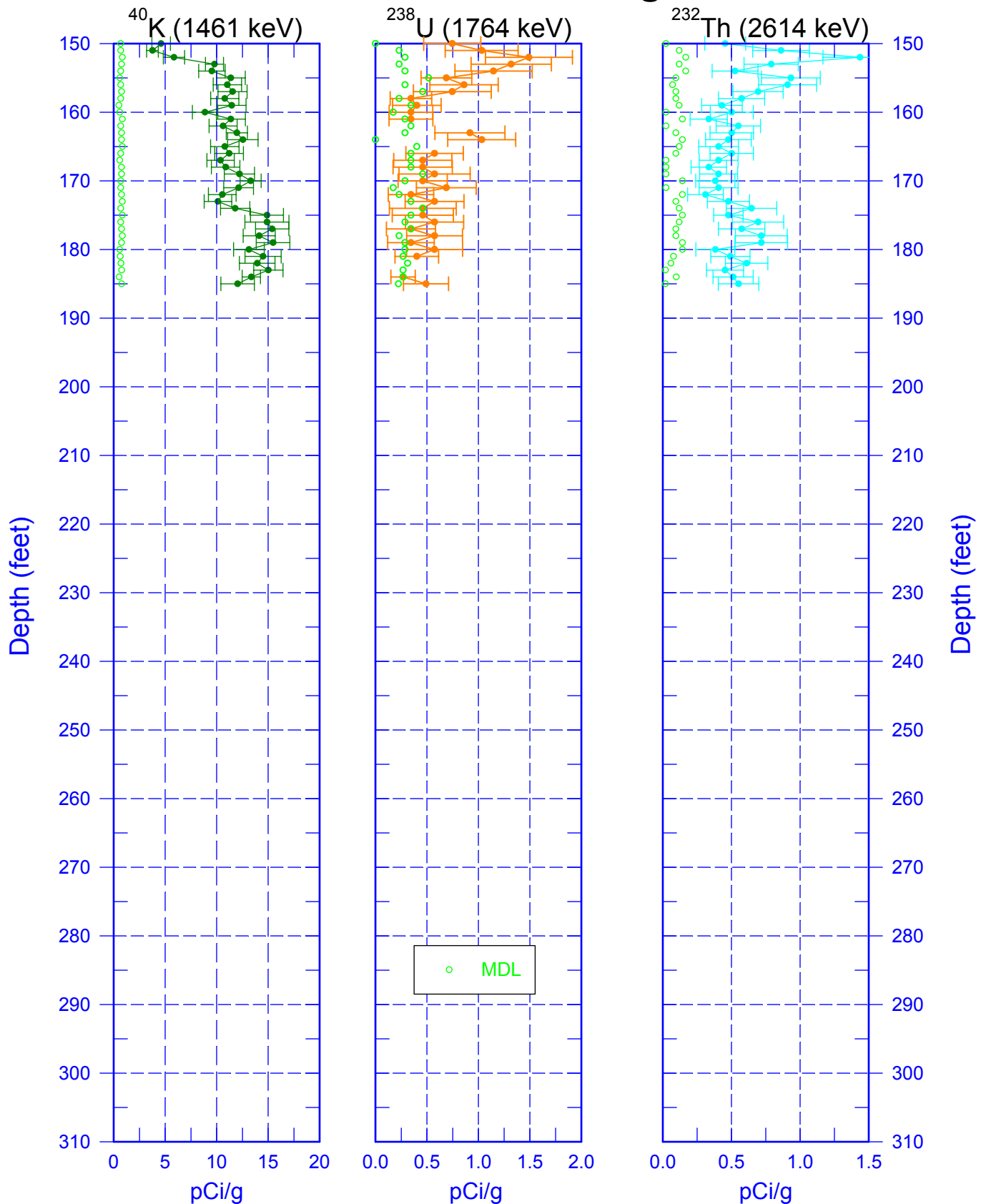


Zero Reference = Top of Casing

Last Log Date - 06/30/05

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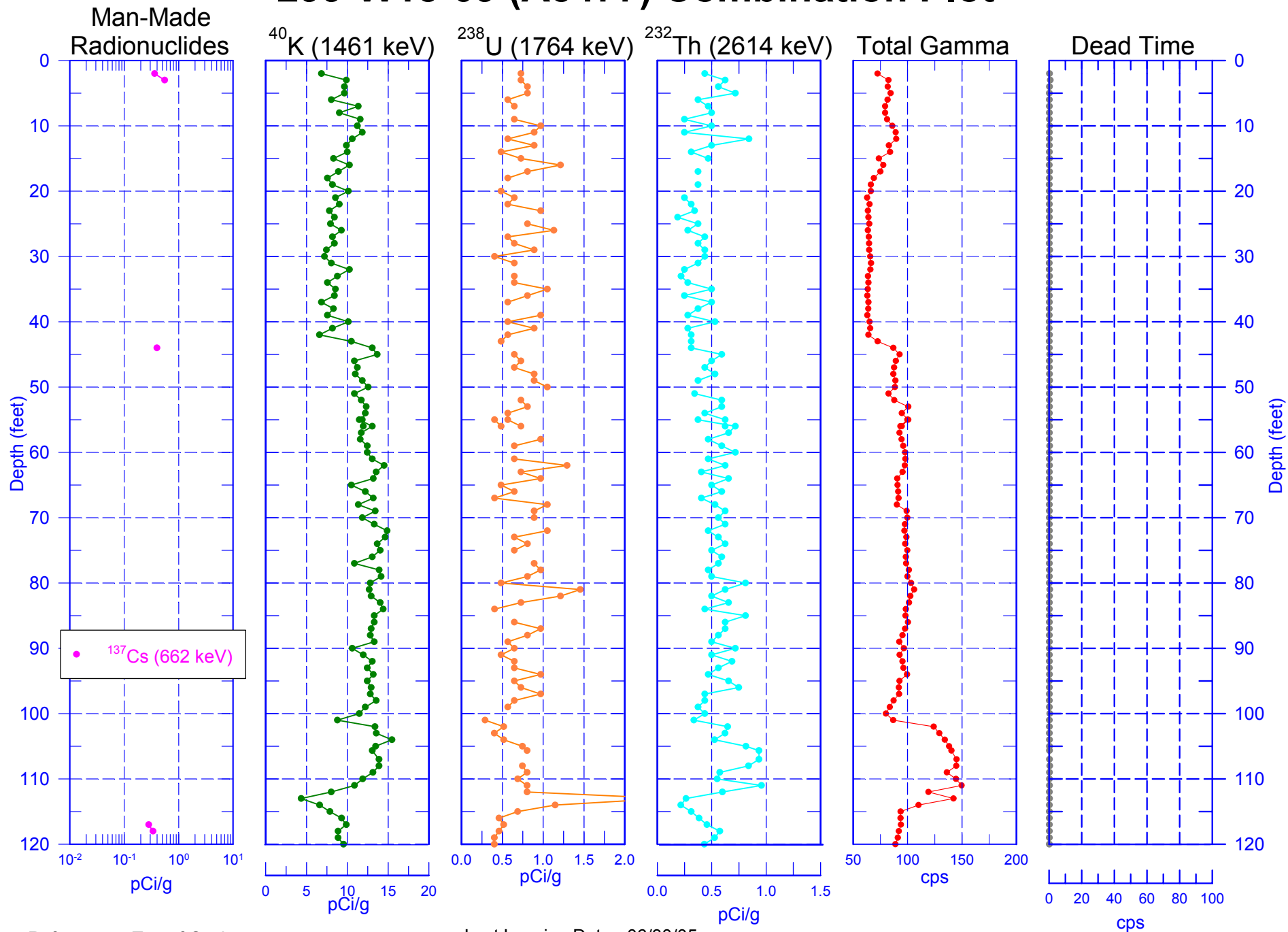
Natural Gamma Logs



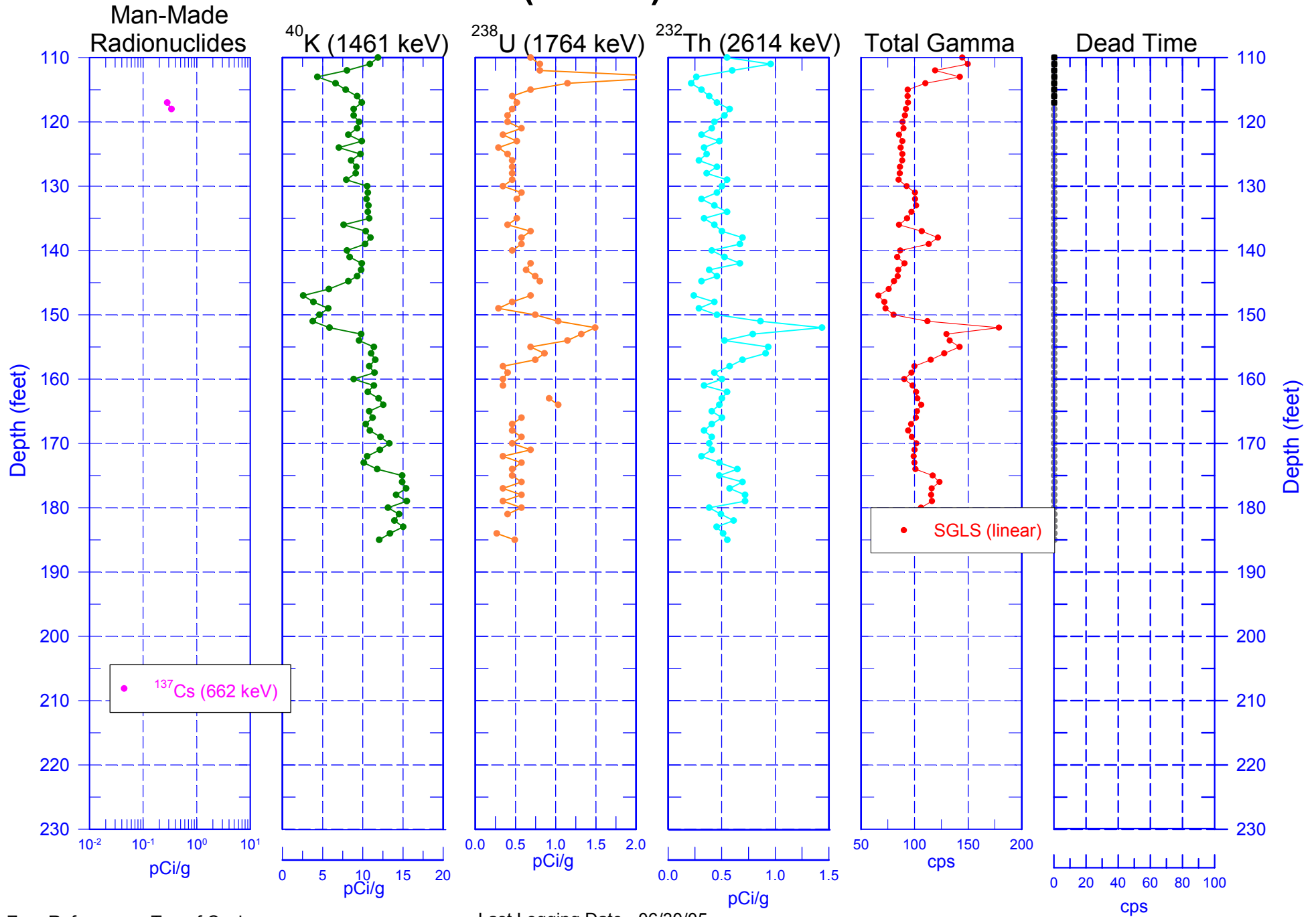
Zero Reference = Top of Casing

Last Log Date - 06/30/05

299-W15-09 (A5477) Combination Plot

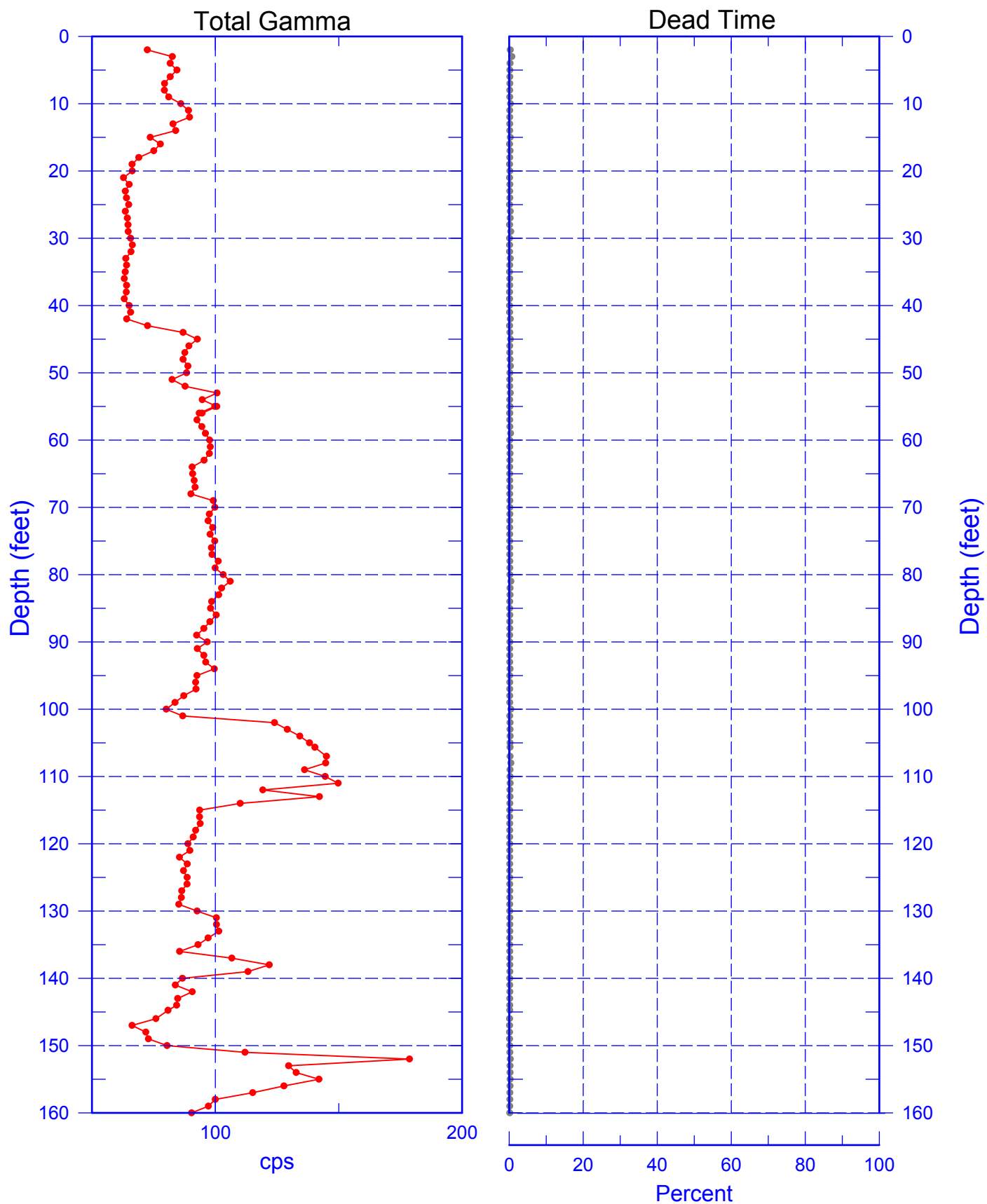


299-W15-09 (A5477) Combination Plot



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Total Gamma & Dead Time

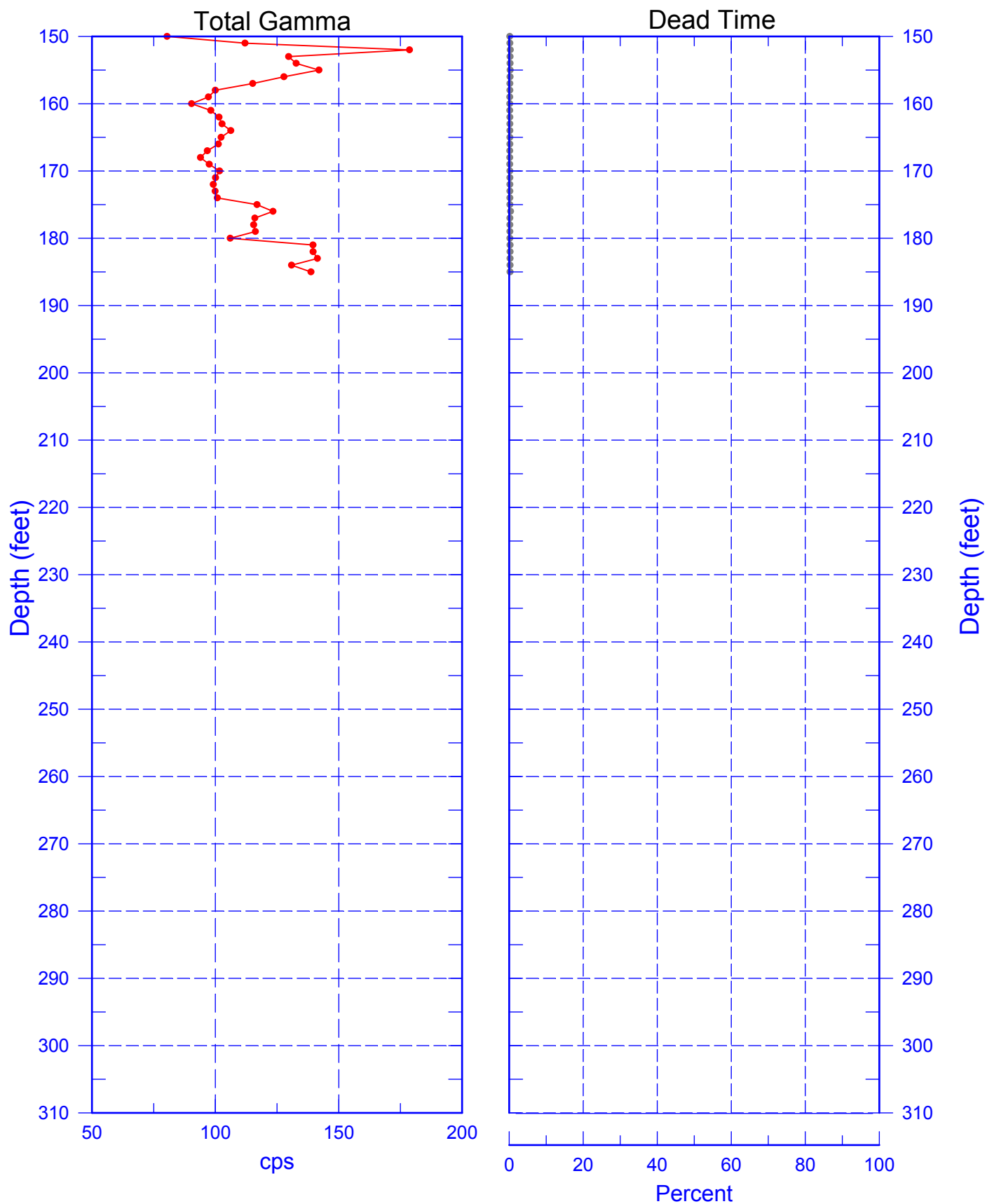


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

299-W15-09 (A5477)

Total Gamma & Dead Time

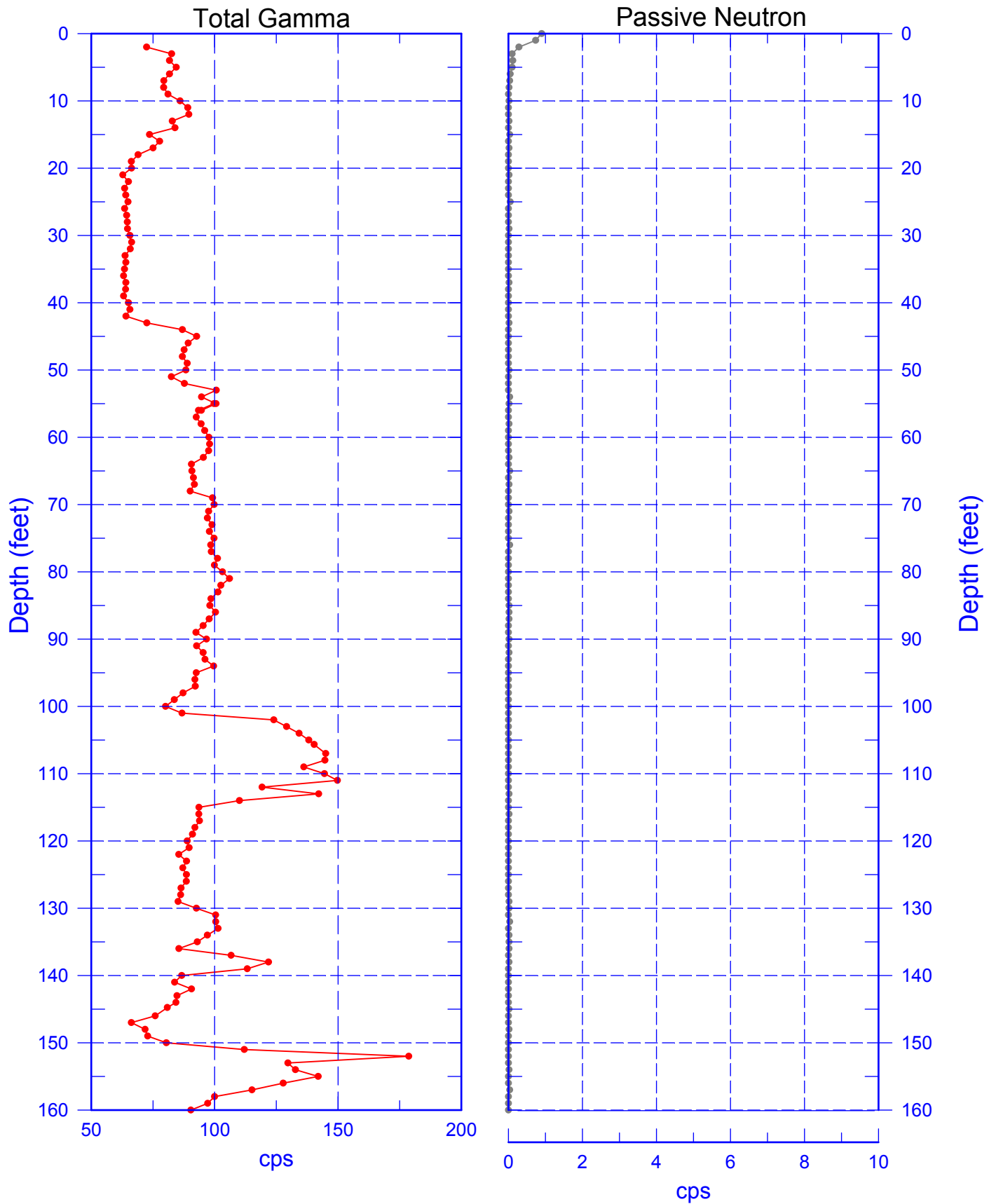


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

299-W15-09 (A5477)

Total Gamma & Passive Neutron

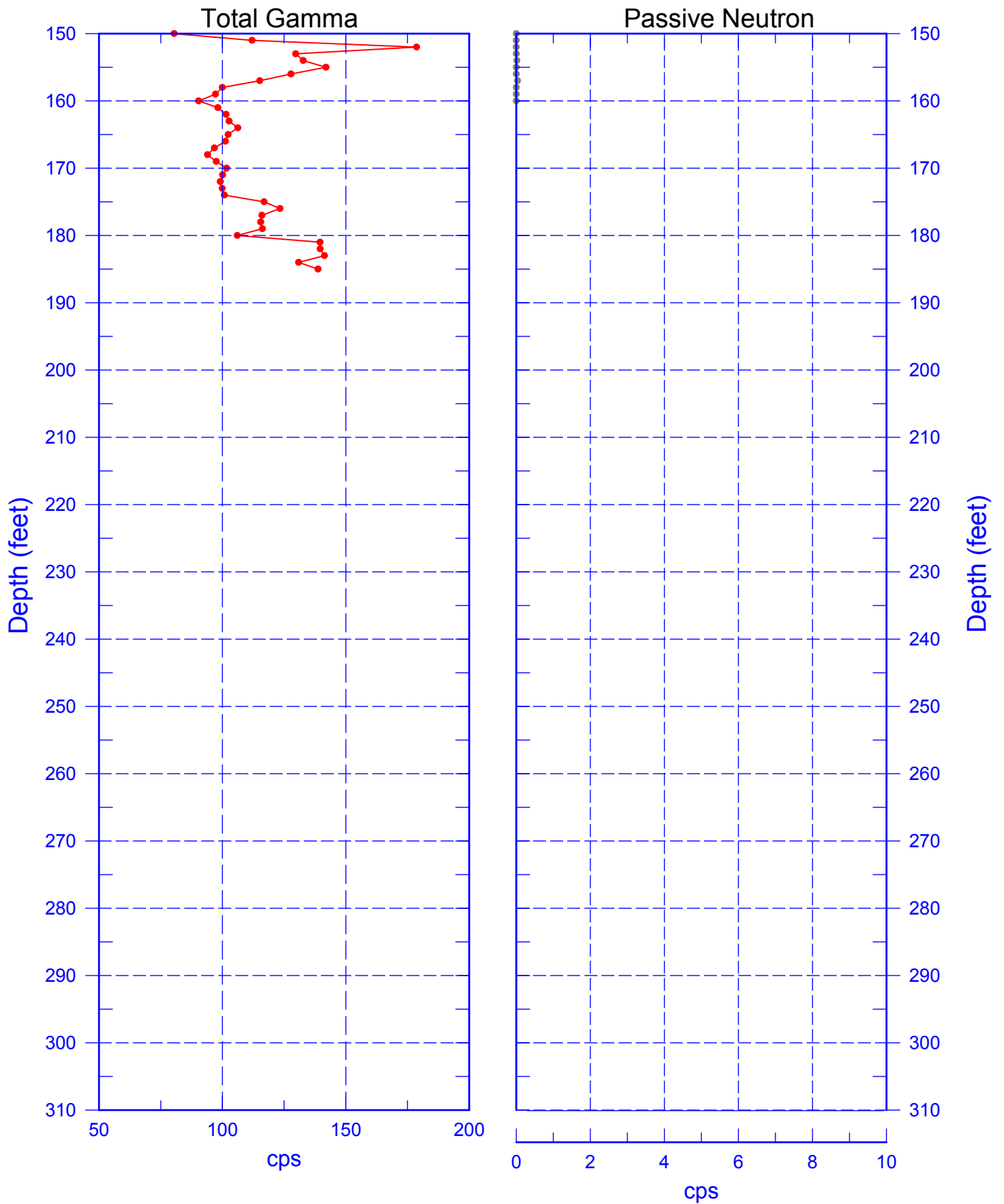


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

299-W15-09 (A5477)

Total Gamma & Passive Neutron

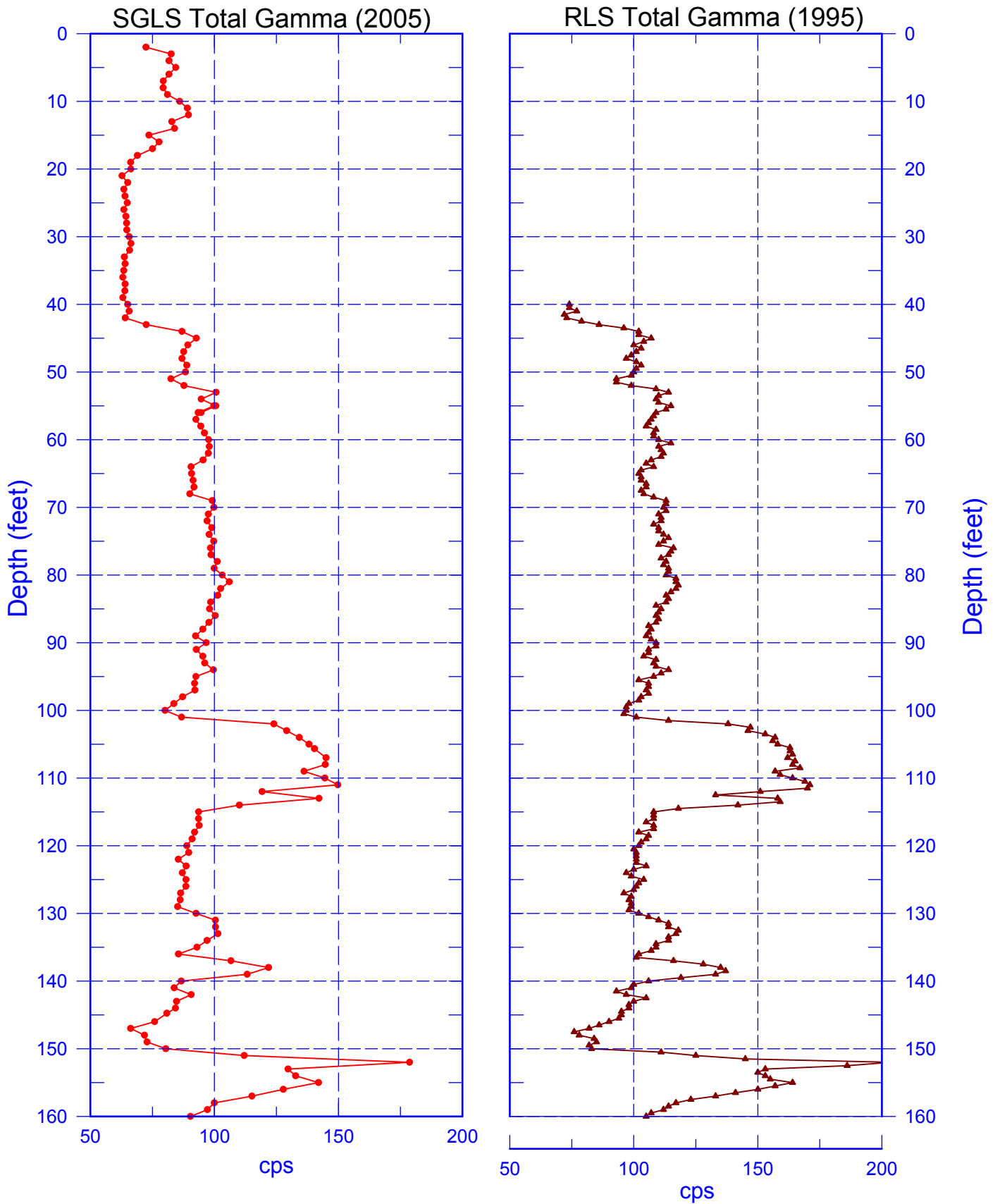


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

299-W15-09 (A5477)

Total Gamma

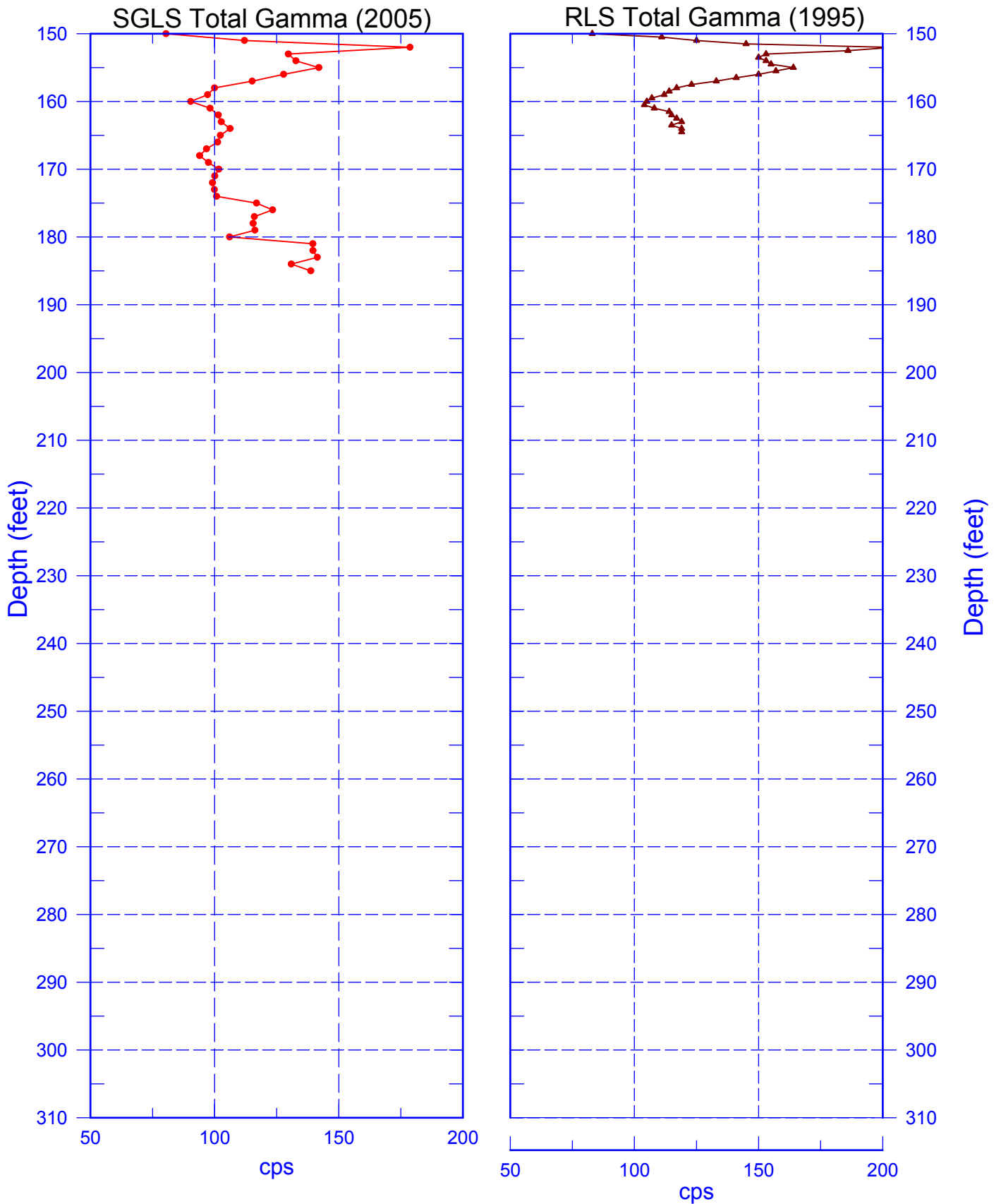


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

299-W15-09 (A5477)

Total Gamma

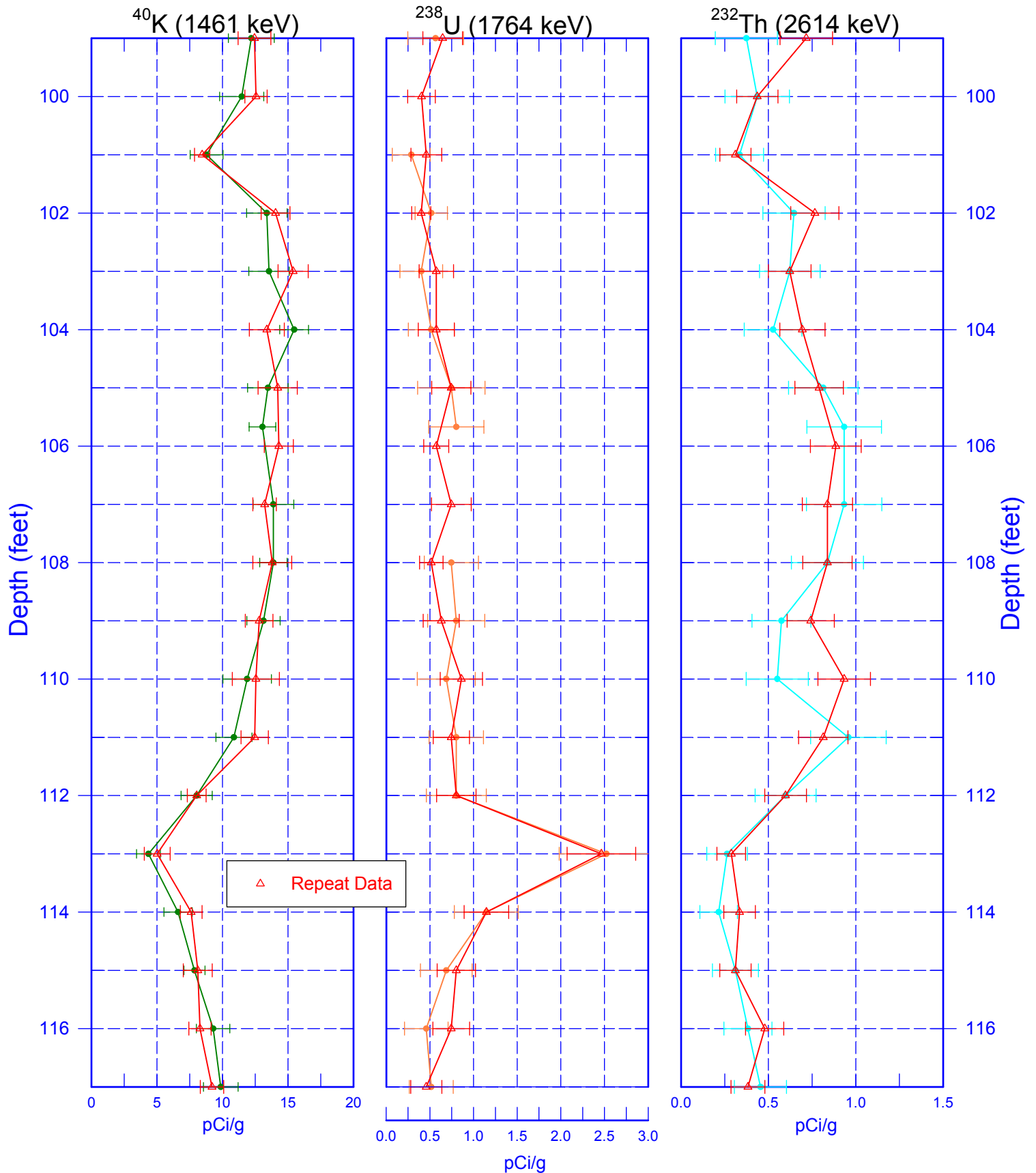


Zero Reference = Top of Casing

Last Logging Date - 06/30/05

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Repeat Section of Natural Gamma Logs



Zero Reference = Top of Casing

Last Log Date - 06/30/05

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Repeat Section for Passive Neutron

